

The Christmas feast

S G REES, R R HOLMAN, R C TURNER

Abstract

Twenty two normal subjects and 13 maturity onset diabetic patients completed an observational study with repeated weighing and fasting blood tests from one month before to one month after Christmas. Over the Christmas period in all subjects an increase in weight was observed (mean 0.8 (SD 0.1) kg, $p<0.001$), which was maintained through January. This may signify an average additional 6000 kcal ingested. By three to six days after Christmas a slight but significant increase in fasting plasma triglyceride ($p<0.03$) and cholesterol ($p<0.02$) concentrations occurred, with a subsequent rise in glycosylated haemoglobin concentration ($p<0.001$). This study is not likely to affect any future Christmas.

Introduction

The Christmas festival was grafted on to a midwinter pagan festival. The time honoured feasting is an obvious but little studied aspect of the celebration. In a diabetic clinic it often seems that every patient attending at the New Year is contrite about recent weight gain. A formal study of the metabolic effects of the Christmas feast was undertaken in non-insulin dependent (type II) diabetics and non-diabetic "volunteers."

Subjects and methods

The study was undertaken with the permission of the Oxford District Health Authority ethics committee. Twenty five normal subjects volunteered for the study but were probably not representative of the general population in that they were laboratory, paramedical, nursing, or medical staff or friends of the same. Of the 21 maturity onset diabetics who joined the study, eight were receiving diet treatment alone and 13 were also taking sulphonylurea tablets, aiming at reducing the fasting plasma glucose concentration to normal.¹ All were seen at regular three monthly intervals as part of the United Kingdom prospective diabetes study.²

All subjects were invited to join a simple, non-intervention, observational study of the body's response to Christmas. They were asked to fast from midnight and to attend between 0800 and 1000 on five occasions—namely, the first week of December, three to four days before Christmas and three to four days, 10-11 days, and one month after Christmas. All patients were weighed on the same scales after removing their snow shoes, overcoats, umbrellas, and so on. A fasting venous blood sample was taken for subsequent measurement of plasma glucose, insulin, triglyceride, total cholesterol, and glycosylated haemoglobin concentrations. Each subject was rewarded with a hot drink, a mince pie, and the convivial atmosphere reminiscent of air-raid shelters in the blitz. Any subject sufficiently foolhardy to attend on all five occasions had his or her name entered for a "draw" with the promise of substantial prizes.

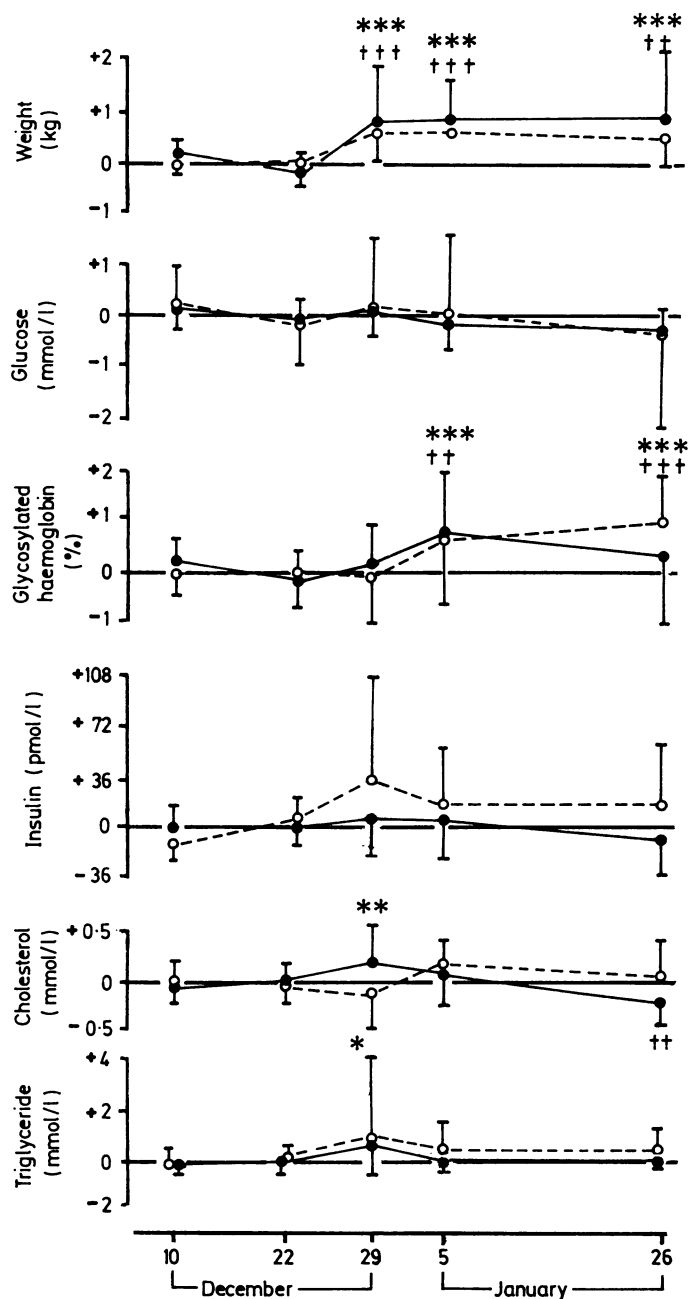
All samples were spun and separated within two hours and the plasma frozen at -20°C until assayed. Plasma glucose was measured manually with a glucose oxidase method and glycosylated haemoglobin by an isoelectrofocusing method,³ with a five hour incubation period of the dialysed sample at 37°C to exclude short term glucose adducts. Plasma immunoreactive insulin was measured by radioimmunoassay,⁴ cholesterol with a Technicon

autoanalyser by the Liebmann-Burchard reaction, and triglyceride enzymatically (Boehringer).

The mean of the two visits before Christmas was taken as a baseline for statistical analyses, with a paired t test for each variable.

Results

Twenty two of 25 normal subjects and 13 of 21 diabetics (four receiving diet and nine sulphonylurea treatment) completed the study. A mean



Mean (SD) change in values from baseline after Christmas period in normal subjects (●—●) and diabetics (○- -○). Normal subjects: * $p<0.05$, ** $p<0.02$, *** $p<0.005$. Diabetics: † $p<0.05$, †† $p<0.02$, ††† $p<0.005$.

Diabetes Research Laboratories, Nuffield Department of Clinical Medicine, Radcliffe Infirmary, Oxford

S G REES, MRCP, research fellow

R R HOLMAN, MRCP, honorary consultant physician

R C TURNER, FRCP, honorary consultant physician

Correspondence and requests for reprints to: Dr Turner.

increase in weight in both normal subjects (0.9 (1.0) kg, $p<0.001$) and diabetics occurred (0.7 (0.6) kg, $p<0.001$), with an increase of over 1 kg in 11 and seven subjects, respectively. The maximum weight gain was 4.3 kg in a non-diabetic woman. The mean increase in weight was maintained to the end of January. No relation existed between weight gain and the degree of obesity in the normal subjects, though the diabetic patients showed a significant correlation between proportion of ideal weight and change in weight to the end of January ($r=0.57$, $p<0.045$).

No increase was noted in the mean fasting plasma glucose concentration over the Christmas period, but at one month after Christmas a reduction occurred in both normal subjects (-0.4 (0.4) mmol/l, $p<0.001$) and diabetic patients (-0.4 (1.8) mmol/l, NS). The mean glycosylated haemoglobin concentration showed no change immediately after Christmas, but had risen significantly in both normal subjects (0.7 (1.2)%, $p<0.01$) and diabetics (1.1 (0.8)%, $p<0.001$) by the end of January. The mean fasting plasma insulin concentration rose in all subjects immediately after Christmas (17.22 (50.9) pmol/l, $p<0.02$). At 10-11 days after Christmas the mean fasting plasma triglyceride concentration showed a significant increase in all subjects (0.6 (1.9) mmol/l, $p<0.03$), as did the total (0.2 (0.4) mmol/l, $p<0.02$) and low density lipoprotein mean cholesterol concentrations (0.2 (0.3) mmol/l, $p<0.04$).

The "draw" was won by a radioimmunoassay technician, and a diet treated diabetic patient won second prize. The volunteers with the greatest increases in weight wished to remain anonymous.

Mean (SD) values from two baseline samples taken at beginning of December and three to four days before Christmas

	Normal subjects (n=22)	Diabetics (n=13)
Men/women	8/14	5/8
Weight (kg)	65.4 (13.5)	80.7 (11.8)
Fasting plasma glucose (mmol/l)	4.5 (0.5)	6.8 (1.3)
Fasting plasma insulin (pmol/l)	48.8 (+33/-19.4)	88.3 (+66/-37.3)
Glycosylated haemoglobin (%)	6.0 (0.7)	7.0 (1.2)
Plasma cholesterol (mmol/l)	4.4 (0.6)	5.1 (0.5)
Fasting plasma triglyceride (mmol/l)	1.21 (+0.88/-0.51)	2.67 (+1.80/-1.07)

Discussion

A highly significant increase in weight occurred in both normal subjects and diabetics during Christmas, which persisted even a month later—could middle aged spread be the ghost of Christmas past? Clearly a randomised, double blind study of the Christmas feast was not feasible. As all the subjects were volunteers and, in the spirit of the Helsinki convention, were fully informed of the nature of the study the possibility that the results are not representative of the population at large cannot be excluded. The normal subjects tended to be remarkably non-obese and the diabetics exemplary in their glycaemic control, having initially responded to the diet as part of the United Kingdom prospective diabetes study.² The increase in weight might well have been greater in less puritanical, less self conscious, and more self indulgent feasters. If one assumes that the increased weight was solely increased adiposity and that a pound of adipose tissue has an energy potential of 3500 kcal⁵ the average subject ingested an additional 6160 kcal during the five days over Christmas. This was sufficient to increase the plasma triglyceride and cholesterol concentrations. Although the fasting plasma glucose concentration did not rise, the post prandial glucose excursions seem to have increased sufficiently to raise the glycosylated haemoglobin concentration. The increase in fasting plasma insulin concentrations suggests that there was an increased insulin resistance, but whether this was secondary to the increased prandial secretion cannot be determined, possibly with down regulation of insulin receptors or via some ill understood mechanism related to obesity.

The results over Christmas are similar to those found in overfeeding of American prisoners,⁶ although the volunteers in the study prefer to think that they had greater freedom of action. It is sometimes said that any lessons that might be gained from clinical studies impinge only slowly on subsequent medical practice. This seems to be the case with this study as the volunteers were not inclined to modify their Christmas customs, although some, having

found with relief how little weight they put on, may indulge more in the future. Several diabetics receiving their low fat, high fibre diet acquired a taste for mince pies and were upset to hear that the study was not to be repeated in subsequent years.

The Medical Research Council and British Diabetes Association support the United Kingdom prospective diabetes study but may not have realised that their patients and staff participate in other epidemiological research. Dr S Claus kindly provided the mince pies, ably assisted by a friend of the department, Miss Ada Hebborn, who provided the hot drinks, moral support, and encouragement. The study was funded by private patients' fees. We thank the volunteers who showed masochistic tendencies above and beyond the call of duty.

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Sir Charles Scott Sherrington by R G Eves.